CLAIMS

1. A method of amplifying an optical beam with a number of spaced, optical-amplifier slabs, with the slabs having two opposed surfaces through which the beam is passed, comprising the steps of:

aligning at least four amplifier slabs having a thickness dimension of not more than 0.3 centimeter, spaced from adjacent slabs, wherein the slab surfaces are rendered essentially non-reflective by being placed within about 1 degree of the Brewster angle with respect to optical input beam, and wherein no two of the slab surfaces are within 0.1 degree of parallel;

optically pumping the slabs; and

passing a polarized input beam through the surfaces, wherein the beam is optically amplified in the slabs, and wherein the input beam is of an eye-safe wavelength, whereby controlling reflections and the use of multiple relatively thin slabs to reduce slab temperature greatly increases efficiency, and the high efficiency together with an eye-safe beam wavelength makes the system commercially practical for use outside of research laboratories.

2. The method of claim 1, wherein the beam is passed through at least four slabs and passed within about 1 degree of a Brewster angle of the slab surfaces, wherein half of the slabs are slanting in one direction and half of the slabs have an opposite slant, wherein using opposite slanting slabs avoids beam spreading in the output beam.

3. The method of claim 1, wherein the slabs are Cr:YAG slabs.

4. The method of claim 1, wherein cooling fluid is passed between the slabs.

5. The method of claim 1, wherein the slabs surfaces being rendered essentially non-reflective by dielectric surface coatings and by being placed within about 1 degree of the Brewster angle with respect to the polarized optical input beam.

6. The method of claim 1, wherein the slabs are pumped directly by pump diodes.

7. The method of claim 1, wherein the beam is passed through the slabs within about 1 degree of a Brewster angle with all slabs tilted in the same direction and a line-shaped beam is entered into the amplifier, and spread into an area during amplification, and the area of the output beam is then optically reduced.

8. The method of claim 1, wherein the beam has a wavelength of between 1400 and 1800 nm.

9. The method of claim 1, wherein the thickness dimension is less than 2 millimeters.

10. A method of amplifying an optical beam with a number of spaced, optical-amplifier-slabs, with the slabs having two surfaces perpendicular to a thickness dimension, comprising the steps of:

aligning at least two slabs having a thickness dimension of less than one centimeter, with surfaces parallel to, and spaced from adjacent slabs, and with slab surfaces being rendered essentially non-reflective by being placed at the Brewster angle with respect to a polarized optical input beam;

optically pumping the slabs; and

passing the polarized input beam of eye-safe wavelength through the surfaces wherein the beam is optically amplified in the slabs.

11. A method of amplifying an optical beam with a number of spaced, optical-amplifier slabs, with the slabs having two opposed surfaces, comprising the steps of:

aligning at least four slabs having a thickness dimension of less than one centimeter, substantially parallel to, and spaced from adjacent slabs, wherein the slab surfaces are rendered essentially non-reflective;

optically pumping the slabs; and

passing an input beam through the surfaces wherein the beam is optically amplified in the slabs, and wherein the input beam is of an eye-safe wavelength.

12. The method of claim 11, wherein no two of the slab surfaces are precisely parallel.

13. The method of claim 11, wherein the slabs have a thickness of less than 3 mm and a diameter of at least 5 mm.

14. The method of claim 11, wherein the beam has a wavelength of between 1400 and 1800 nm.

15. The method of claim 11, wherein the slabs are pumped directly by pump diodes.

16. The method of claim 11, wherein the beam is passed through at least four slabs and passed within about 1 degree of a Brewster angle of the slab surfaces, wherein half of the slabs are slanting in one direction and half of the slabs have an opposite slant, wherein using opposite slanting slabs avoids beam spreading in the output beam.